

**EPA Comments on Technical Memorandum, Monitoring of the 903 Pad/Ryan's Pit Plume:****GENERAL COMMENTS:****General Comment No. 1:**

The primary conclusion stated in this document is that hydrogeological factors are limiting the 903 Pad/Ryan's Pit groundwater plume's migration, and that surface water is not being impacted by the plume. Although the general rationale behind this conclusion is explained in the document, it is somewhat vague and not adequately demonstrated. From the information presented in this document, many questions are left unanswered. Since hydrogeological factors are given the most importance in controlling plume migration, these should be described and displayed as graphically as possible, using cross-sections, maps and more detailed descriptions. EPA agrees with the proposed action of installing three downgradient permanent wells in an effort to delineate the extent of the plume and monitor changes over time and distance. Depending upon the information provided by these wells, it might be necessary to install others as well.

**Response:**

Although the data in the Technical Memorandum suggests that hydrogeological factors are limiting the 903 Pad/Ryan's Pit plume's migration, this will further be evaluated through monitoring of the plume (details are presented in the *Sampling and Analysis Plan for Groundwater Monitoring at the 903 Pad/Ryan's Pit VOC Plume*, RMRS, March 1999). The figures presented in the Technical Memorandum have been updated to reflect hydrogeological factors in the area. Figure 1-2 depicts the limited migration pathways available for the groundwater flow based on groundwater elevations and analysis of groundwater data. Cross-sections, located in Appendix B, have also been included for both the east-west section of the plume, and the north-south sections of the plume. Additional text has been added to Section 2.2 that further discusses site hydrogeology.

The locations of specific slump blocks are not possible to determine with the available data. The whole hillside is colluvium and therefore, represents many years of soil movement downslope. Rather than focus on how these movements have impacted groundwater, the approach has been to determine where groundwater flows so that all paths between the source area and surface water are identified. Although upgradient effects, such as low permeabilities and discontinuities in the geology, can retard and attenuate contaminants, it will be the change in contaminant concentrations over time in wells downgradient that will determine whether attenuating effects are actually protective of surface water.

**General Comment No. 2 :**

Since the plume is present in several wells that are within 150' of the south Interceptor Ditch (SID), it is entirely possible that surface water in the SID is being impacted by the plume. Relying on surface water samples from SW027, which is approximately 1500' downstream from where this plume might enter the SID, is not sufficient to conclude that no impact is occurring. This needs to be investigated by sampling the SID, and Woman Creek as well, in several locations that are the most likely for groundwater plume impact.

**Response:**

Additional grab samples will be taken from surface water and seep locations to present a more complete picture of surface water impacts. Text has been added to Section 1.1, 3<sup>rd</sup> Paragraph, 2<sup>nd</sup> sentence, explaining the investigations planned for the SID and Woman

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Creek. Further details on the sampling frequencies, locations, and analytical methods are presented in the *Sampling and Analysis Plan for Groundwater Monitoring at the 903 Pad/Ryan's Pit VOC Plume* (RMRS, March 1999).

#### **SPECIFIC COMMENTS:**

##### **Specific Comment No. 1:**

Lithologic cross-sections, including water levels, screened intervals, contaminants detected, slump block interpretations. At least one east-west cross-section using the 1998 geoprobe locations and other wells; two or more north-south cross-sections that illustrate east and west portions of the plume.

##### **Response:**

Lithologic cross-sections have been included in this technical memorandum, Appendix B. One of the fence diagrams is drawn from the source area to the area of greatest contaminant flux to better illustrate the stratigraphy associated with contaminated groundwater flow.

##### **Specific Comment No. 2:**

Plume maps should be updated, making use of analytical data from all wells within the study area.

##### **Response:**

The plume maps have been updated, see Figures 2-1 through Figures 2-4.

##### **Specific Comment No. 3:**

Figure 2-8 showing the primary groundwater flow path(s) was not included in the document. This should be included and also show unsaturated zones.

##### **Response:**

The reference to Figure 2-8 was a typographical error and should have referenced Figure 1-2 (see Section 1.1, 1<sup>st</sup> paragraph, 2<sup>nd</sup> sentence and Section 2.4.3, 1<sup>st</sup> paragraph, 2<sup>nd</sup> sentence after bullet list). The primary groundwater flow path(s) are now shown on Figure 1-2.

##### **Specific Comment No. 3:**

Show the location of all known seeps and describe what is controlling seep locations.

##### **Response:**

The locations of the seeps have been added to Figure 1-2. A description of what is controlling the seep locations is presented in the tenth paragraph of Section 2.2. Basically the preferential pathways caused by the bedrock topography are controlling the seep locations. This information was utilized in determining well locations. The effect of preferential pathways on the seeps is well illustrated in Figure 1-2.

##### **Specific Comment No. 4:**

Explain/illustrate how and where slumping is controlling groundwater migration.

**Response:**

Due to the complexity of the colluvium, it is difficult to know exactly how slumping occurred and what the physical characteristics are outside of what has been already reported in the *Geologic Characterization Report for the Rocky Flats Environmental Technology Site, Volume 1 of the Sitewide Geoscience Characterization Study, Final Report* (EG&G, April 1995). However, the groundwater flow downgradient is known, which is probably more relevant than the upgradient factors influencing that flow. A detailed description of the hydrogeologic setting has been added in Section 2.2, paragraphs 3 through 7.

**Specific Comment No. 5:**

Present historical analytical data of key wells (2987, 1187, 01291, 23196, 1487, 0491, and 7391).

**Response:**

The historical analytical data is now presented in Appendix A of this technical memorandum. Data for well 23196 was not included in the Appendix because there were no "hits" at this well (i.e., all contaminants were undetected). The 1996 data for this well is included on Table 2-1, page 10.

**CDPHE Comments on Technical Memorandum, Monitoring of the 903 Pad/Ryan's Pit Plume:**

**GENERAL COMMENTS:**

**General Comment No. 1:**

Section 1.0: "The Ryan's Pit source removal was completed in 1996..." and in Section 2.0 "Source removal activities were completed at Ryan's Pit in 1995,..." These statements are confusing. Soils were removed in September 1995, treated in February 1996, and the project was completed in August 1996 with replacement of soils.

**Response:**

The confusion has been eliminated by adding text to Section 1.0, 1<sup>st</sup> Paragraph, 4<sup>th</sup> sentence stating that "Ryan's Pit source removal activities began in September 1995 with the removal of contaminated soils. The contaminated soil was treated in February 1996, and the project was completed in August 1996 with replacement of soils." The text in Section 2.1, 4<sup>th</sup> Paragraph, 1<sup>st</sup> sentence, now states, "Source removal activities for Ryan's Pit began in September 1995 with removal of contaminated soils and was completed in August 1996."

**General Comment No. 2:**

There appears to be a pathway to and possibly from well 2987. What was the reason for excluding this portion of the plume? What is the TCE time series for this well? Does it contain any degradation products? A subsequent conversation with Craig Cowdrey revealed these were old plume maps and this plume configuration was due to a one time TCE hit.

**Response:**

The plume maps have been updated with the latest data. An appendix has been added to the document showing analytical results for this well along with several other area wells. As seen in Appendix A of the Final Technical Memorandum, Well 2987 does not contain any degradation products of TCE (i.e., dichloroethene and vinyl chloride). The one time hit of 1,600 ug/l of TCE in 10/92 is considered an anomaly. The time-series graph for Well 2987 shows that from 12/89 to 10/92 TCE concentrations ranged from 0.2 to 4 ug/l, and from 12/92 to the present TCE concentrations range from non-detect to 0.2 ug/l.

**SPECIFIC COMMENTS:**

**Specific Comment No. 1:**

Section 2.4.3 refers to a Figure 2-8 which is not included in this document.

**Response:**

The reference to Figure 2-8 was a typo., and should have referenced Figure 1-2. The primary groundwater flow path(s) are now shown on Figure 1-2.

**Specific Comment No. 2:**

Section 3.1 - What is the justification for annual sampling?

**Response:**

Section 3.1, 3<sup>rd</sup> Paragraph, 4<sup>th</sup> sentence has been modified to say, "Monitoring will be initially performed quarterly in conjunction with the IMP activities during the first year to optimize the seasonal aspects of water level and VOC concentration variations, while

minimizing costs and other resources. Subsequent sampling timing and frequency will be specified in the IMP based on the sampling results of the first year.”

**Specific Comment No. 3 (Part 1):**

The physical hydrogeologic framework of this plume needs better documentation. The areas where groundwater is surfacing and discharging contaminants should be identified.

**Response:**

The locations of the seeps and channel vegetation where groundwater may be surfacing have been added to Figure 1-2. Recent field observations of seep characteristics indicate that surface flow, when present, is intermittent and minimal. Since preferential groundwater flow pathways may cause significant local effects on groundwater flow and discharge, including seep occurrence, that can affect monitoring and system design, the *Sampling and Analysis Plan for Groundwater Monitoring at the 903 Pad/Ryan's Pit VOC Plume* (RMRS, March 1999) discusses the sampling of surface water in these areas.

**Specific Comment No. 3 (Part 2):**

None of the maps have been improved from the Draft Conceptual Remediation Design document regarding our comments of 9/24/98.

**Response:**

CDPHE comments (9/24/98) on Draft Conceptual Remediation Design Document that pertain to the figures and maps in the Draft Technical Memorandum are addressed below:

General Comments from 9/24/98:

This project needs considerable improvement in the documentation of the conceptual model. The pathways are not developed above or below the line of geoprobe holes. The top of bedrock map is incomplete, it needs better resolution to determine pathways. The water level map is based on next to nothing, solid lines are drawn with no data points and potential upgradient data is not included. These maps need to cover the study area from the suspected sources to the stream.

**Response:**

Figure 1-2 has been included to better define the groundwater pathways.

Specific Comments from 9/24/98:

**Specific Comment No. 1:**

Page 1-2: Slump features and a scarp face are discussed in the area of interest however this appears to be a later interpretation than the Geologic Characterization Report or the OU2 RFI/FI. Please provide a map of the features mentioned.

**Response:**

Due to the complexity of the colluvium, it is difficult to know exactly how slumping occurred and what the physical characteristics are outside of what has been already reported in the *Geologic Characterization Report for the Rocky Flats Environmental Technology Site, Volume 1 of the Sitewide Geoscience Characterization Study, Final Report* (EG&G, April 1995). However, the groundwater flow downgradient is known, which is probably more relevant than the upgradient factors influencing that flow. A detailed description of the hydrogeologic setting has been added in Section 2.2, paragraphs 3 through 7.

Specific Comment No. 2:

Page 1-3: The paleochannels in this discussion are not apparent on the top of bedrock map provided in this report. Please provide a map showing the whole area of interest and including interpretation of the data obtained in this and any further investigations.

Response:

Speculation on paleochannels has been avoided in this document. Instead the effect of the bedrock surface has been addressed by mapping preferential flow pathways and the top of bedrock. (See Figures 1-2 and 1-3)

Specific Comment No. 3:

Page 3-2: Additional sampling above and below the plume transect would improve the information available to evaluate natural attenuation. A cross section down the eastern lobe of the plume is necessary to conceptualize this pathway.

Response:

A cross-section down the east-west portion of the plume (see Figure B-2) has been provided in the Final Technical Memorandum.

Specific Comment No. 4:

Page 3-5: MW51193 appears to be on the south side of Woman Creek, why is it included in sampling for natural attenuation? We would like to see interpretive maps justifying the location of the three wells proposed north of Woman Creek. Well 1487 is good to include in this evaluation but wells closer to the source must be included also such as 00491 and sandstone bedrock wells upgradient of the discharge point.

Response:

Based on an evaluation of data the approach to monitoring has been changed to focus on downgradient effects on surface water rather than demonstrating biodegradation in or near the source area.